

## ATOMIC LAYER-DEPOSITED $\text{LaAlO}_3$ FILMS FOR GATE DIELECTRICS

### ABSTRACT

5           A dielectric film containing  $\text{LaAlO}_3$  and method of fabricating a dielectric film  
contained  $\text{LaAlO}_3$  produce a reliable gate dielectric having a thinner equivalent oxide  
thickness than attainable using  $\text{SiO}_2$ . The  $\text{LaAlO}_3$  gate dielectrics formed are  
thermodynamically stable such that these gate dielectrics will have minimal reactions  
with a silicon substrate or other structures during processing. A  $\text{LaAlO}_3$  gate dielectric is  
10       formed by atomic layer deposition employing a lanthanum sequence and an aluminum  
sequence. A lanthanum sequence uses  $\text{La}(\text{thd})_3$  (thd = 2,2,6,6-tetramethyl-3,5-  
heptanedione) and ozone. An aluminum sequence uses either trimethylaluminum,  
 $\text{Al}(\text{CH}_3)_3$ , or DMEAA, an adduct of alane ( $\text{AlH}_3$ ) and dimethylethylamine  
[ $\text{N}(\text{CH}_3)_2(\text{C}_2\text{H}_5)$ ], with distilled water vapor.

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